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TESTS ON ADAPTIVE INTELLIGENCE IN DOGS AND CATS, AS COMPARED WITH ADAPTIVE INTELLIGENCE IN RHESUS MONKEYS

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This paper is a report of experiments which were made with dogs and with cats to ascertain to what degree they compare in adaptive intelligence with Rhesus monkeys. The tests on the latter animals, which have been already reported,¹ were made the basis of the experiments on the dogs and cats and will be restated here. Following that, we shall give an outline of the results of similar tests made on the other animals.

By the term "adaptive intelligence," we may designate a lower variety of reasoning. The term reasoning has been used in a variety of ways, and the following definitions include the most important meanings that have been given the term: *A*, implied reasoning (Harris), e. g., my recognition of yonder horse; *B*, inference from particular to particular (James), e. g., the bird which finds bread upon the window one morning comes back the next morning; *C*, adaptive intelligence, the ability to adapt to our purposes conditions more or less difficult and more or less unfamiliar; *D*, analogical reasoning, which involves construction or creation, e. g., to reach an upper window, I utilize a ladder which I find; *E*, rational thinking (James); *F*, formal or syllogistic reasoning.

With the purpose of investigating the matter of the presence of "adaptive intelligence," as above defined, in Rhesus monkeys, the following experiments were made on those animals:

Adaptive Intelligence in Monkeys.—1. A piece of twine was let hang in front of and twelve inches away from the cage, beyond the reach of the longest-armed animal which was tested. At the end of the twine a piece of banana was arranged; a thin piece of wood was pushed through the banana and turned so that one end could be grasped by an

¹ W. T. Shepherd, Some Mental Processes of the Monkeys, *Psychol. Rev. Mon. Sup.*, XII, 1911.

animal in the cage. By grasping and pulling the stick inwards, the food could be secured. All the eleven animals were tested in this experiment. The results with all but one of the animals were similar, and a description of the actions of the one will suffice to indicate the reactions of all. As soon as the banana and the stick were arranged, monkey 6 put her arm through the wire of the cage, seized the end of the stick, drew it towards her, and secured the banana. This experiment was repeated a number of times and in all there was an immediate characteristic response. There appeared to be a decided adaption of means to end. No efforts were wasted on random movements. It did not appear that any preliminary attempt was made to grasp or even to reach for the food, but there was an immediate movement toward the stick. The results for all animals are given in Table I, in which are shown the approximate time for the performance of the act by each animal in each trial. The absence of hesitation, the direction of the movement away from the food towards the stick, and the promptness with which the food was seized, all speak for the presence of adaptive intelligence in ten of the monkeys. It would seem that it is always found in these animals.

TABLE I

ADAPTIVE INTELLIGENCE. *Suspended food and stick. Three or six trials each animal. Times in seconds; f means failed*

Trials and animals	1	2	3	4	5	6
1	60	10	3			
2	4	3	3			
3	20	6	9			
4	105	40	11			
5	f	f	f			
6	2	1	1			
7	6	4	3	1	1	1
8	6	4	4	3	3	3
9	5	3	3	3	4	2
10	2	1	1	1	1	1
11	5	5	3	3	3	3

In this test the results with monkey 5 were decidedly different from those with the other animals, in that he failed in the trials given him. Monkeys 1 and 4 had considerable difficulty in getting the food in the first and second tests;

but there was no gradual acquisition of the method of securing food in the other eight animals. The times for solving the problem in the second and third tests were approximately the same as those in the first test for monkeys 3, 6, and 10; and there was not much difference in the time between the first and later tests for monkeys 3, 7, 8, 9, and 11. Much if not all the difference in time can be accounted for by the better adjustment to the wire netting of the cage, the pushing of the hand through the proper place, etc.

II. A second test of the presence of adaptive intelligence was made as follows: A light wooden lever 18.5 inches long was attached by leather hinges at one end to a board which rested on the floor. The hinge of the lever was four inches from the end of the horizontal board, well within reach of the animals. The lever was inclined at an angle of approximately 45 degrees from the horizontal, and could be moved forward in a vertical plane. The apparatus was placed outside a cage, the lower end of the lever being within, the upper end being beyond the reach of the animal. A piece of banana was placed at the farther end of the lever, and the problem for the animal to solve was how to secure the food, which was beyond direct reach.

Eleven monkeys were tested with this apparatus, and all with the exception of monkey 4 succeeded in the first trial. In the first tests the animals usually took a longer time to get the food; but as in the previous experiment this delay was largely one of making the adjustment of the hand to the proper opening in the wire netting and not to attacking the apparatus in the wrong manner.

Monkey 4 appeared to be frightened at the time of the first trial and I showed him that food was to be secured by moving the lever against the cage and permitting him to secure the food. In the succeeding trials he immediately attacked the lever and obtained the food in the same manner as the other animals. Monkey 9 was in the cage with Monkey 8 when the latter was being tested and may have taken the opportunity to observe Monkey 8. That she performed the trick may have been due to imitation; but I credit her with having performed it in the same way as the other animals. It is reasonable to suppose that Monkey 4 would have been able to manipulate the apparatus without being shown if sufficient time had been allowed. In many of the experiments the animals did not use both hands for moving the lever, but one hand for moving the lever and the other

for securing the food when the upper part of the lever was within reach. Table 2 gives the time records for four monkeys in this experiment; those for the other animals were approximately the same as those noted in the table, although no accurate measurement by watch was taken.

III. One end of a piece of twine, one yard long, was attached to a bucket and the other end was placed within the cage. The bucket was placed at the distance of the length of the twine from the cage; and a piece of food was fastened to the top of the bucket in sight of the animal. The problem was for the animal to draw in the bucket by pulling on the string and thus secure the food. In all cases, the animals seized the twine immediately, drew the bucket toward the cage and seized the piece of banana.

Table III gives the times for Monkeys 7 and 8. These times are similar to those of the other animals.

TABLE II

TABLE III

Trials and animals				Trials and animals										
	1	2	3		1	2	3	4	5	6	7	8	9	10
1	9	4	3	7	6	4	3	3	4	3	3	4	3	3
2	6	4	3											
3	2/5	2	2	8	0	3	3	2	2	3	2	2	2	3
4	f	6	3											

The results of the foregoing experiments indicate the possession by monkeys of adaptive intelligence, of a low form of reasoning. The times for the performance of the different acts are reasonably conclusive, but in addition, the appearance of the animals, their actions, etc., especially during the first trial in each experiment, seemed to show an understanding of the problem. There was no fumbling with the apparatus, no appearance of learning by trial and error; but there was instant action following apparently, instantaneous understanding of the situation.

Adaptive Intelligence in Dogs.—As a test of adaptive intelligence in dogs, as compared with that shown by the monkeys in the preceding experiments, I repeated some of the tests made with the monkeys. Three individuals were thus tested. Dog 1 was a rather small mongrel male, two and a half years old; Dog 2 was a large male, part hound, four years old;

Dog 3 was a female, medium size, of uncertain stock, three years old. The results with all the animals were negative, and will be reported briefly.

I. The first experiment was similar to the first test made with the monkeys. Food was suspended by a cord in front and just beyond reach of the animal. A stick was passed through the food and one end extended a short distance within the cage, so the dog might seize the end of it with his teeth. By thus seizing the end of the stick within the cage, the animal could draw the food up and within the cage and so secure the piece of meat. It will be seen that the dogs had a slight advantage of the monkeys by this arrangement.²

The results, however, were wholly negative. The dogs scrambled about the side of the cage next to the suspended meat, pawed and sometimes bit at the side of the cage, but made no effective attempt to seize the end of the stick and draw in the food. They each appeared to have no understanding whatever of the problem. They all failed entirely in six trials of one minute each.

II. A second experiment similar to the third experiment with the monkeys was made, i. e., a bucket was placed at the distance of a string one yard long, and with a piece of meat fastened to the top, and in sight of the dog, having the loose end of the string within the cage. The dog, if he possessed the adaptive intelligence, could seize the end of the string in his teeth, draw up the bucket to the cage and thereby secure the food.

In this test again, unlike the monkeys, the dogs all failed, apparently showing no understanding of the problem and no ability to cope with it. There was only a general scramble around the cage, and at the side next the bucket, at the sight of the tempting meat. Sometimes they would appear to give it up.

Here again we appear to see the superiority of the monkey intelligence in dealing with difficulties and in adapting conditions to their needs. We must, however, remember the superiority of the monkeys' motor equipment for dealing with this sort of problem. It might not be safe to conclude that a dog could not do equally as well on his own ground, e. g., in a hunting problem. Furthermore, I do not doubt but that, as Thorndike³ has pointed out, the apparent superior general

² It should be remembered that in a similar experiment with the monkeys the nearest end of the stick was outside the cage.

³ E. L. Thorndike, *The Mental Life of the Monkeys*, *Psychol. Rev. Mon. Sup.* III, 1901.

intelligence of the primates is largely accounted for by their superior sensori-motor equipment. But I still believe that they possess a modicum of something resembling real mentality, not present in other animals. On an evolutionary hypothesis, we might expect such to be the case.

Adaptive Intelligence in Cats.—I. Two cats were used in this experiment. Both were full grown and apparently of fair intelligence, although neither was of very active habits.

Both cats were tested under experimental conditions similar to those in experiments with both monkeys and dogs, i. e., a piece of meat was suspended in front of the cat's cage, with a stick run through it, and as in the case of the dogs, projected through the wire into the cage.

In brief, the results were similar to those with the dogs: There was a total failure to understand the problem, or even to try to seize the stick and pull in the food. The cats scrambled about the cage at the side next the suspended meat, but it never seemed to occur to them to use the stick as a means of drawing in the food. Each animal was given six trials, and two minutes were allowed in each trial.

II. The second test was similar to the second experiment with the monkeys,—that is, the inclined lever with food on the outer end was employed. The cat was to reach its paw through the wire, seize the lever end which was within its reach and thus draw up the food to the cage. The results were similar to the results of the previous experiment. There was an entire absence of any evidence of an adaptive intelligence similar to that shown by the monkeys in a like experiment.

We conclude, therefore, that both dogs and cats are absolutely inferior to Rhesus monkeys in dealing with problems of the character of those herein reported and with experimental conditions of a similar nature. This, however, may be due in part to the superior motor equipment of the primates. It is also possible that under experimental conditions more favorable to them, dogs and cats might show an equal or even a superior ability to that of monkeys. However, the writer ventures to infer that in the matter of adaptive intelligence in general, Rhesus monkeys are much superior to their humbler congeners.